SECRET

ROUTING AND RECORD SHEET

INSTRUCTIONS: Officer designations should be used in the "TO" column. Under each comment a line should be drawn across sheet and each comment numbered to correspond with the number in the "TO" column. Each officer should initial (check mark insufficient) before further routing. This Routing and Record Sheet should be returned to Registry.

FROM:	NO.
C/PPC	DATE 22 December 1953

TO	ROOM NO	DATE REC'D	DATE FWD'D	OFFICER'S INITIALS	COMMENTS
1. TSS/Admin/TPB		12/8/53		IC	C/PPC to TSS/Admin/TPB: This Staff is not qualified to give useful comments on such projects as the one attached.
2. POB					
3. TSS/APD					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

FORM NO. 51-10
FEB 1950

16—61155-1 U. S. GOVERNMENT PRINTING OFFICE

A 1114 SECRET

1 December 1953

MEMORANDUM FOR: See Distribution

SUBJECT : Customer Requirements for Electronic Cache Locator

1. The attached data describes the Electronic Cache Locator, a device currently under development by Technical Services Staff.

2. Before entering the final development phase on this item, TSS is asking its customers to scan the attached material and give us their comments. Your cooperation will enable TSS to provide you with a better product and to effect money savings which will eventually show up in your future operations.

3. Specifically, here is what we would like to know:

(a) Do you feel the device will fill a practical need and are you interested in TSS going ahead with the development?

(b) Do you have any suggested modifications on how the item might be packaged to make it more suitable for field applications?

(c) How many development units do you estimate your Staff or Division will need for field testing? TSS plans to order a limited number of development units; thus we need your estimate as a basis for our development-run order. Cost of development items is born by TSS.

(d) If the system proves acceptable, how many finished production-units do you estimate your Staff or Division will require for operational use? This information has an important effect on the future cost of production items. If your estimates forecast quantity production we can lay on certain requirements with our contractor now which will save you money when you want to procure the items for operational use.

4. Please address your replies to C/TSS/TO and we would appreciate having them on or before 8 January 1954.

50X1

Acting Chief
Technical Operations
Technical Services Staff

Distribution:
Chief FI (3)
Chief PM (3)
Chief PPC (3)
Chief each Area Division (3)

Info:
C/TSS/TO (2)
C/TSS/POD (1)
C/TSS/APD (1)

DOCUMENT NO.
NO CHANGE IN CLASS. ☐
DECLASSIFIED
CLASS. CHANGED TO: TS S (C) 2011
NEXT REVIEW DATE:
AUTH: HR 70-2

S-E-C-R-E-T
SECURITY INFORMATION

ELECTRONIC CACHE LOCATOR

A. Purpose of the Cache Locator System:

The purpose of the cache locator system is to provide a sure means for locating within a few inches a cache whose exact location is unknown. It may also be used as a label to distinguish one cache from another.

B. Theory of Operation:

The cache locator system is of two parts, the detector and the transponder. The transponder is a tuned resonant circuit which is buried with the cache. It is completely passive, all power being supplied by the detector, and consequently has a life dependent only on the quality of its packaging. The detector is also a resonant tuned circuit of about the same frequency as the transponder (100 kc) which is excited by an oscillator. The Q ($Q = \frac{2\pi a}{b}$, where a = energy stored in tuned circuit and b = energy dissipated in circuit during one cycle) of this tuned circuit is measured by a Q meter integral in the detector design. The output of the Q meter is an audio signal whose volume is proportional to the Q measured. In use the detector is tuned to the frequency of the particular transponder to be found. As the detector approaches the transponder, the transponder is excited by the electromagnetic field of the detector and dissipates energy. This energy removed from the detector field appears as energy dissipated in the detector tuned circuit. Consequently, a decrease in the effective Q of the detector tuned circuit and a decrease in the audio output of the Q meter occurs. In practice the latter decrease appears as a null in the detector headphones.

C. Physical Characteristics of the Prototype Used in Recent Field Tests:

The transducer used in the field tests is a doughnut shaped coil 14-7/8 inches outside diameter, 10-1/8 inches inside diameter, 2-5/8 inches thick, weighing 6-1/2 pounds. It is packaged in a watertight plastic impregnated fiberglass shell. It is planned that 20 frequency channels between 80 and 100 kc will be provided in the production versions of the transducer. This means that 20 separate caches may be identified in the same area.

The detector used on the field tests when folded is 16-1/4 inches long, 14 inches wide, and 4 inches thick overall and weighs 15 pounds, 12 ounces. It is planned that the production model of the detector will be built into an indigenous suitcase.

D. Results of Recent Field Tests:

In a recent test three transponders were buried, two at a depth of 5 feet and one at a depth of 4 feet, in soil which was a mixture of clay and gravel. It was found that the transponders buried at 5 feet could be detected at a horizontal distance of 4 feet while the one buried at 4 feet could be detected at a horizontal distance of 5 feet. It was also noted that when the operator was walking with the detector, reliable detection of the transponders occurred only when at a distance of 2 feet or less from the transponder. Consequently when sweeping an area with the detector the sweeps should be made in parallel paths about 4 feet apart. All transponders buried during the tests were located within a distance less than 8 inches from the center of the transponder.

E. Operational Characteristics as Suggested by Field Tests:

It is assumed that the user of this system will have some idea of the location of the cache so that he will be able to lay out an area of the order of a few acres in which the cache is to be found. The user will then proceed to sweep the area. First he will open the suitcase and unfold the coil. Then he will turn on the detector, put on his earphones; and adjust the detector, first for frequency and second for signal volume in the earphones. He will then carry the suitcase open in one hand with the coil a few inches from the ground and proceed to sweep the area by walking in parallel paths four feet apart. When he approaches to within two feet of the cache, a null is detected in the phones. Then by determining the center of the null, the user can locate the cache position within less than 8 inches.

F. Possible Modifications and Improvements:

The production model of the detector will be 16-1/4 inches long, 14 inches wide, 3 inches thick and will weigh 10 pounds. No further reduction in size is expected due to the required coil size. Reduction of the coil size reduces the range severely.

No reduction in size and weight of the transponder is practical at present. A transponder 8-1/2 inches outside diameter, 4 inches inside diameter, 2-5/8 inches thick, and weighing 3-1/2 pounds gave a maximum horizontal range of 2 feet when buried at a depth of 4 feet compared with 5 feet for the larger transducer. This means that the parallel search paths would have to be about 2 feet apart.

G. Cost of System:

1. Estimated Price of Transponders:

Quantity	Price Each
100	$68.00
1000	22.00
10000	11.50

2. Estimated Price of Detectors:

Quantity	Price Each
10	$900.00
100	600.00
1000	450.00